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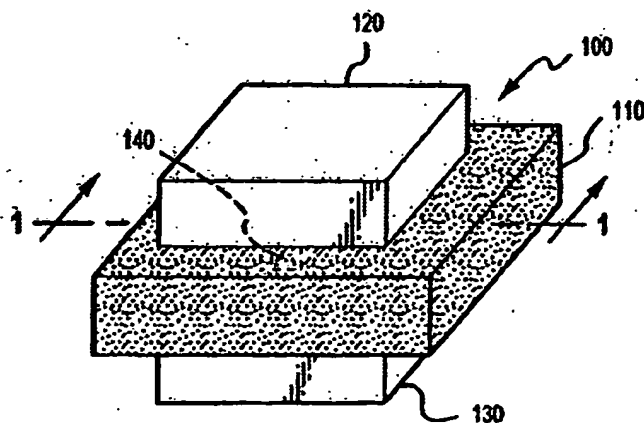
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(54) Title: PROGRAMMABLE SUB-SURFACE AGGREGATING METALLIZATION STRUCTURE AND METHOD OF MAKING SAME

(57) Abstract

A programmable sub-surface aggregating metallization structure ("PSAM") includes an ion conductor such as a chalcogenide glass which includes metal ions and at least two electrodes disposed at opposing surfaces of the ion conductor. Preferably, the ion conductor includes a chalcogenide material with Group IB to Group IIB metals. One of the two electrodes is preferably configured as a cathode and the other as an anode. When a voltage is applied between the anode and cathode, a metal dendrite grows from the cathode through the ion conductor towards the anode. The growth rate of the dendrite may be stopped by removing the voltage or

the dendrite may be retracted back towards the cathode by reversing the voltage polarity at the anode and cathode. When a voltage is applied for a sufficient length of time, a continuous metal dendrite grows through the ion conductor and connects the electrodes, thereby shorting the device. The continuous metal dendrite then can be broken by applying another voltage. The break in the metal dendrite can be resealed by applying yet another voltage. Changes in the length of the dendrite or the presence of a break in the dendrite affect the resistance, capacitance, and impedance of the PSAM.



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